# RECORDS OF THE AUCKLAND MUSEUM

VOLUME 57 | 2023


Tāmaki Paenga Hira Auckland War Memorial Museum

# The Auckland War Memorial Museum Collection of Stone Tools from Pitcairn Island, Southeast Polynesia

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**Abstract**
Auckland Museum Tāmaki Paenga Hira holds approximately 20,000 stone tools from Pitcairn Island. Acquired in the 1930s–1950s it is the largest museum-held collection of tools from the island. A wide range of tool types are represented across all manufacturing stages, use and condition. The collection remains largely under researched, just as the history of Polynesian occupation on Pitcairn is poorly understood. An initial description of the Auckland Museum's unique collection is provided within the known archaeology of the island, while also exploring Pitcairn's position in southeast Polynesia as a source of valuable stone material.

**Keywords**
Pitcairn Island; Polynesia; archaeology; stone tool; basalt; Auckland Museum.

## INTRODUCTION

Auckland Museum Tāmaki Paenga Hira holds the largest known Pitcairn collection totalling approximately 20,000 stone tools. A wide range of tool types are represented including adzes and adze roughouts, chisels and gouges, fishhooks, hammer stones, *yolla* (grater) stones, pounders, files and abraders, and stone flakes. Despite historical collecting practices resulting in poor provenance within the island (Furey and Ash 2020) the collection represents tools across all stages of manufacture, use and condition, and can inform on methods of tool production, use and repair. Famously known as the final landing place of the *Bounty*, Pitcairn was unoccupied when the mutineers sought refuge from the British Navy on 23 January 1790. There is also evidence of earlier Polynesian occupation including marae, petroglyphs, stone artefacts and introduced food plants (Erksine 2004: 167; Gathercole 1964: 4). The tools will be discussed within the context of the limited archaeological evidence from the island, while also exploring Pitcairn's position as a source of valuable stone material.

## BACKGROUND

Situated at the margins of Central East Polynesia, the Pitcairn Group consists of the volcanic island of Pitcairn (5 km$^2$), the raised limestone island of Henderson (37 km$^2$) and the two small coral atolls of Oeno and Ducie. Pitcairn's closest neighbours outside the Pitcairn Group are Mangareva (15 km$^2$), approximately 400 kilometres west in the Gambier Group, and Rapa Nui 1,700 kilometres to the east, making Pitcairn one of the most geographically isolated places on earth (Weisler 1996: 615). Topographically Pitcairn is the summit of a volcano with an eroding northern rim, steep sides, (Gathercole 1964: 3) and very little flat land. The island is cliff bound with no protective reef, limiting safe landing in rough seas (Cowell 1965: 72; Erksine 2004: 10). Despite the isolation and challenging environmental conditions both Pitcairn and Henderson show evidence of long-term Polynesian settlement.

Previous investigations on Pitcairn, summarised in Furey and Ash (2020: 3–4), discuss the presence of habitation sites, postholes, oven stones, stone working areas and a small quantity of food refuse including fish, bird, and pig bone (Gathercole 1964: 77; Sinoto 1983: 61). The existence of at least three marae point to sustained occupation of Pitcairn, rather than short-term visits (Routledge 1919: 303–314). Two uncalibrated early radiocarbon dates 615±105 (I-5629) and 590±105 (I-5630) (Sinoto 1983: 361) have large standard errors, and two later dates 180±50 (B-62940) and 140±70 (B-62937) (Weisler 1995: 389) are available, but the wider colonisation story for the southeast Pacific indicates the earliest evidence has not been located (Weisler 1995, 1996). Pitcairn-sourced stone in dated sites on neighbouring islands suggests a date around 11th–12th century AD for the initial settlement of Pitcairn (Kirch *et al.* 2010; Kirch *et al.* 2015; Sinoto 1983: 61; Weisler 1995: 89–90), consistent with the generally accepted chronology for wider Central East Polynesia (Molle and Hermann 2018: 73; Weisler and Green 2001).

## STONE RESOURCES

Basalt outcrops are found in several places on the island, with an especially fine-grained source located at Tautama on the seaward side of the crater rim (Fig. 1). Tautama offers one of the best quality sources of fine-grained basalt in Central East Polynesia (Molle and Hermann 2018: 78). The basalt has few phenocrysts, fractures sub-conchoidally, and is geochemically high in silica, which all contribute to its fine-grained and flakeable properties (Gathercole 1964: 44; Sheppard *et al.* 2001; Weisler 1996). Stone was sourced from flows at the base of the cliff and eroded blocks on the talus slope. Gathercole (1964: 38) described a strip of flakes 10 yards (9 m) wide running from the base of the cliff to the sea. The absence of finished tools at the quarry source (Gathercole 1964: 43) could be attributed to widespread fossicking in the 1930s and 1940s, but there is also an absence of finished tools at Tahanga in New Zealand as adze blanks were removed to settlements for further shaping and finishing (Turner and Bonica 1994; Turner 2000). The rocky beach at Down Ha Cask, where basalt boulders display fracturing and flaking, was also noted as a likely source (Gathercole 1964: 40–44). The importance of stone working is visible across the landscape with Gathercole noting 'the entire island is a site' due to the large concentrations of waste debris, up to one metre thick in some areas (Cowell 1965: 73; Gathercole 1964: 19).

Volcanic tuff of distinctive red colour was another important material employed in tool manufacture. Located at Red Hole on the north-east coast and at Jinser Walley cave on the south-west coast (Fig. 1), seams of tuff were likely mined using basalt tools found on the floor of the cave, similar in appearance to flaked, unfinished adzes and points (Gathercole 1964: 49–51; Heyerdahl and Skjölsvold 1965a: 6, 1965b: 155, Plate 1). The material was used for abraders and files, with fragments found in association with tool manufacture across the island. It was also shaped into large *tiki* figures [statues] which graced the now destroyed marae (Heyerdahl and Skjölsvold 1965a: 3–5). Volcanic glass erodes from cliffs at Down Rope (Fig. 1), described in Gathercole (1964) as small sub-rounded cobbles of ignimbrite with patches of grey and black glass of poor quality. Flakes of this material were employed for scraping and cutting (Weisler 1995; Weisler and Green 2001: 429)

## CHARACTERISTICS OF THE PITCAIRN COLLECTION

Throughout the 19th and early 20th centuries a large number of stone tools were removed from the island (see Furey and Ash 2020; Gathercole 1964). Observing the potential to generate income, Pitcairn Islanders in the 1930s–1950s began systematically collecting stone tools to sell. Auckland Museum was a major purchaser and smaller transactions with private collectors and other museums, such as Canterbury Museum and Otago

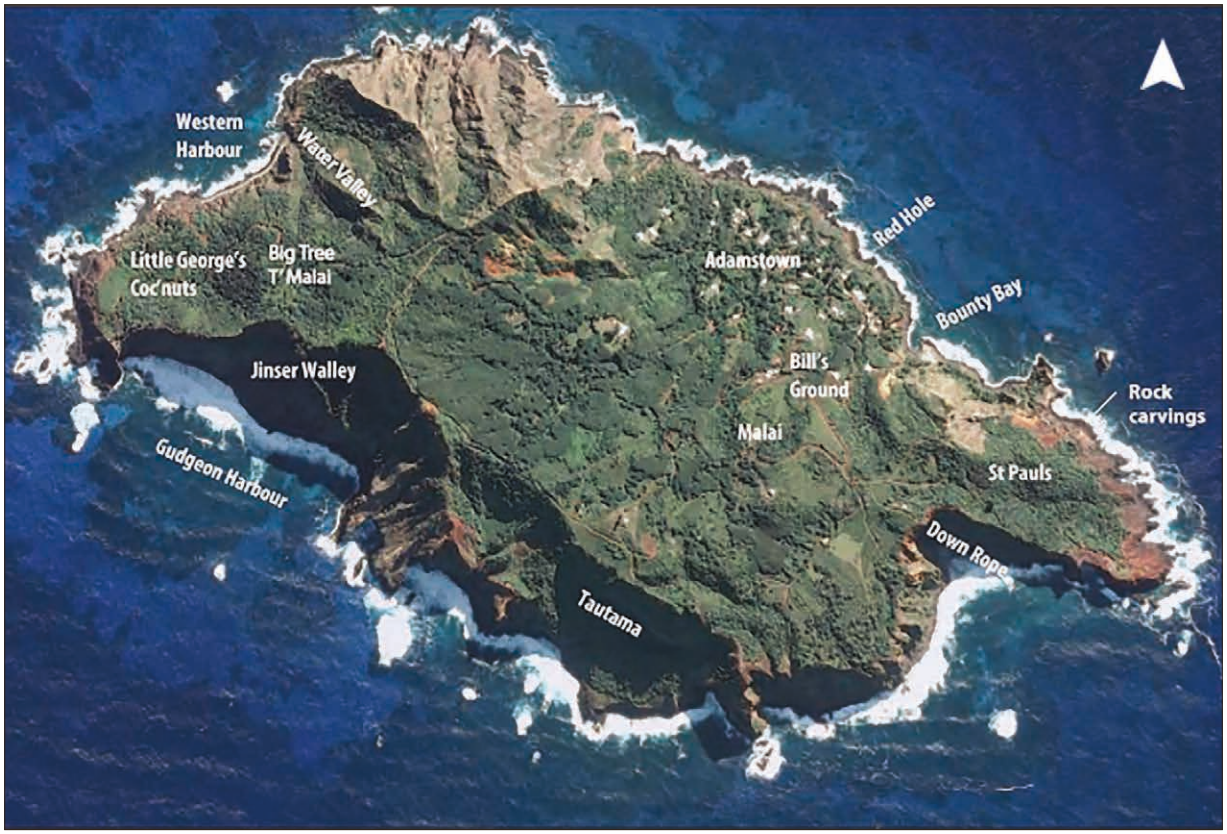


Figure 1. Map of Pitcairn Island highlighting key sites and landmarks mentioned in the text (Furey and Ash 2020: 2)

Museum, also occurred. Museum collections in the northern hemisphere are comprised predominately of complete adzes selected based on size or unique form (Emory 1928; Furey and Ash 2020; Gathercole 1964; Hamilton *et al.* 2013).

Auckland Museum's Pitcairn collection is predominantly surface collected material found while clearing vegetation or during gardening activities. The amount paid for finished adzes was greater than for roughouts, providing a monetary incentive for islanders to also dig in likely areas (Furey and Ash 2020: 8). The collection has a significantly higher proportion of roughouts to ground adzes, supported by Sinoto's excavation of a pit at Jim's Ground which produced a single finished ground adze and 61 adze blanks (Sinoto 1983: 61). Gathercole's excavations possibly produced similar results as he commented on the general absence of finished tools (Gathercole 1964: 43). However, the contents of his excavated assemblages in Otago Museum are unknown, and have not been examined. There is likely little difference between surface collected and excavated material, with the qualifier that the museum collection does not contain many stone flakes which were evidently abundant in working areas and settlement sites (Gathercole 1964: 38; Sinoto 1983: 61; Weisler 1996: 621)

The collection comprises stone one-piece fishhooks, stone drill points/awls, abraders, hammer stones, scrapers and sinkers, with chisels, gouges, adzes and adze roughouts making up the bulk of the collection. Many tools equate with those described by Brown (1900), Emory (1928) and Heyerdahl and Skjölsvold (1965b) and are considered unique to Pitcairn Island (see stone points and miscellaneous objects below). Turner (2010) provided an important description of the adzes and quantification of some, but not all, artefact types. Her count of 12,065 objects did not include approximately 8,000 objects that have continued to be added to the museum database since 2010. Approximately 97% of the items are manufactured from fine-grained basalt, likely from the Tautama source, however geochemical analysis is required to confirm this. A number of these basalt artefacts display a distinctive oxidised red-orange exterior with a dark grey interior. Tools are also manufactured from red volcanic tuff, obsidian, vesicular basalt and coral, and there are a few post-Bounty objects made from metal and stone (Fig. 2). Stone tools in all stages of manufacture, use and condition are present making the collection highly valuable for investigations of Polynesian stone tool technology.


Figure 2. Square head nail from post-Bounty occupation. Auckland War Memorial Museum 1985.332.1400

## Adzes, Roughouts, Chisels and Gouges

Earlier descriptions of Pitcairn adzes (Brown 1900; Duff 1959; Emory 1928; Figueroa and Sanchez 1965) focused on small numbers of complete adzes that were often large and of unusual shape. The adzes in Auckland Museum (Figs 3–5) suggest that these examples are likely to be a result of selective collecting and are a misleading representation of the overall assemblage. Turner's (2010) analysis of nearly 6,000 adze and adze roughouts in Auckland Museum followed the same methodology employed in the study of New Zealand adzes manufactured from Tahanga basalt. In addition to addressing technical aspects her approach focused on the life history of an artefact (Turner 2000, 2005) and was able to make several significant observations about the characteristics of Pitcairn basalt and the impact on tool manufacture and morphology. Roger Duff's (1959) descriptive classification of adze types based on cross section shape has dominated Polynesian adze studies for decades and was previously used to explore cultural relationships between island groups. Deficiencies in Duff's classification have been identified (Shipton *et al*. 2016) and technological studies of flaking and adze manufacture, coupled with an understanding of how certain adze shapes performed in wood-working tasks, revealed shape and use was also dictated by the properties of the material used (Sheppard *et al*. 2001; Shipton *et al*. 2016; Turner 2000, 2005) creating a more complex interpretation than Duff. However, for ease of description of overall shape, Turner retained Duff's Types 1–6.

Pitcairn adzes display a high degree of breakage with unbroken primary (original shape) adzes and roughouts accounting for only 12.6% of the examined tools (Turner 2010: 136). Despite an abundance of raw material, a distinctive feature is the amount of recycling: 71% of the broken adzes and 79.7% of the roughouts have been reworked into other tools. This is similar to the amount of re-working of adzes from Tahanga (Turner 2000) and Papeno'o Valley, Tahiti (Kahn 2009),


Figure 3. Chisels and gouges manufactured from fine-grained basalt. A–B, chisels. C–G, gouges, illustrating range of forms described in the text. Auckland War Memorial Museum 31214.1, 28881.2, 30141.1, 2019.x.58, 28398.1, 28445.1, 28324


Figure 4. Adzes manufactured from fine-grained basalt. Auckland War Memorial Museum 32014.6, 24360.1, 17016.1, 28890

however, unlike these examples which were re-worked into new adzes, Pitcairn adzes were re-worked into other tool types such as drill points/awls. The low incidence of re-working into new adze forms could be attributed to the abundance of available basalt and the method of construction. Sub-vertical joints within the basalt flow allowed the parent rock to split along fracture planes (Turner 2010: 148). The blanks were therefore often thin and tabular, requiring little additional shaping. One face of the adze commonly displays little or no flaking due to the properties of the stone.

The collection is dominated by narrow-bladed type 6 tools (N=4,398), described as chisels if the blade edge is straight (N=1,762) (Figs. 3a, b) and gouges (Fig. 3c) if the blade is curved (N=529). Due to the absence of the blade edge this distinction could not be made for the remainder. These tools are often small with complete examples measuring 48–305 mm with a mean length of 122 mm and standard deviation of 47. Triangular and quadrangular cross sections are the most common, represented in 48% and 25% respectively. Variation within the type 6 tools, particularly the gouges, suggests use for specialised and finely detailed wood working.

Infrequent examples measure over 200 mm in length, are circular or triangular in cross section and often well ground (Figs 3c, d). Other examples are thick and heavy and only present as fragments: Figure 3f measures 40 mm across, is well ground on the fragment remaining, and has a planoconvex cross section. Complete examples are illustrated elsewhere (Brown 1900; plate IV). Steep, narrow blades measuring less than 5 mm are another notable feature and often associated with tapering of the blade and butt ends (Fig. 3e). These forms are well ground, some displaying a multi-facetted cross section created by grinding (Fig. 3g). Butt modification includes polish and hammer-dressing for in-line hafting, reduction and the more unusual examples display shoulders and projections (Figs 3d, g). Chipping and bruising damage to the poll is also common.

The second most common is the wide-bladed type 2 adze (N=1,004) which Turner (2010) and Shipton *et al.* (2016) have argued were used for forming and dressing planks (Fig. 4a), followed by type 4 (N=166) for primary wood reduction (Fig. 4c), and type 3 (N=21) for shaping curved surfaces. Thick and heavy functional type 1 (N=11) for cutting large trees (Fig. 4b), and type 5 (N=8) (Fig. 4d), also known as side hafted, for hollowing out logs and use in tight spaces, are underrepresented, consistent with descriptions of other adze collections from the island (Brown 1900; Emory 1928; Figueroa and Sanchez 1965). No complete examples of type 5 are present in the collection. Type 1 adzes are the largest with a mean length of 260 mm. Irrespective of Duff's classification, and including non-classifiable adzes, the assemblage is dominated by trapezoid cross sections consistent with origins as tabular blanks with flaking on the sides to shape.

Interesting features include flaring of the blade towards the cutting edge, predominately seen on type 2 adzes, a high degree of modification in the butt (haft) area, including reduction in thickness to the front and one or two shoulders. Reduction using flaking or grinding is common, with little hammer-dressing (Emory 1928; Turner 2010), possibly attributable to the properties of the basalt that allowed stone to be easily shaped (Turner 2010: 147). Projections in the butt area are a feature primarily seen on types 2, 4 and 6.

Unique tools which more closely resemble hafted knives or ulu include Figures 5a, b with a shallow cross section, severe butt reduction to a small knob and wide blade. A similar example is presented in Brown (1900: Plate IV) and Figueroa and Sanchez (1965: Plate 2-3e). Figure 5c displays marked spade shoulders, a poll with pronounced ground projections and a thin quadrangular cross section. A similar tool is described as a cleaving implement by Emory (1928: 132, plate 2a). These tools are all well ground.

Experimental work with adzes of different cross sections and shapes (Shipton *et al*. 2016; Turner 2010) suggest the Pitcairn adzes represent a range of types for use in specific wood working actions. While Turner (2010: 135) emphasised canoe manufacture as a primary


Figure 5. Unique adzes. A–B, adzes with reduced knob-like butt. C, unique adze with spade shoulders and poll features. Auckland War Memorial Museum 28319, 28318, 26344

industry, house timbers, bowls and other containers, paddles and implements all required a similar range of adze types. Large tree species growing on Pitcairn are limited in number (Florence *et. al*. 1995) and in the medium height range of 7–10 m, although it is likely in primary forest the trunk diameter could be a metre or more at the base. Canoe construction from a tree this size and diameter would require multiple planks to be joined together, accounting for the dominance of wide-bladed tools for forming planks, and narrow gouges and chisels for lashing holes. This scenario does not entirely account for the low incidence of type 1 and type 5 adzes, however, which would most likely be used for felling trees and hollowing out the base of composite canoes.

## Stone fishhooks

Fishhooks from Pitcairn are rare. Auckland Museum has a single complete one-piece hook and eight broken or unfinished hooks fashioned from fine-grained basalt, plus several roughly shaped stone fragments that could represent early stages of manufacture (Fig. 6a–h). Only four other fishhooks are known: complete hooks in Fiji Museum and Otago Museum, and a complete hook and tab in Canterbury Museum (Green 1959: 21). The complete example in Auckland Museum (Fig. 6h) is 43 mm long and is a rotating one-piece hook with a round cross section, similar to the hook in Otago Museum (Skinner 1942: Fig. 73). The point leg is slightly curved and the tip is acutely in-turned with a


Figure 6. Stone fishhooks. A, possible stone fishhook blank. B–F, fishhooks showing stages of manufacture. G–H, fragment and complete stone fishhooks. Auckland War Memorial Museum 2020.x.28, 28325.1, 1985.332. 26, 28325.2, 31035, 28325.3, 32013, 31134

narrow gap between tip and shank. If complete Figure 6g would have been similar. The method of manufacture appears similar to that reported for stone fishhooks from Rapa Nui (Metraux 1940: 174–176) and is not dissimilar to that used to make one-piece hooks in bone and shell in New Zealand and elsewhere in Polynesia.

A rectangular shape was formed through flaking of the edges to create a tab (Fig. 6a), then the centre of the tab was drilled out from both sides. Five of the fishhooks are in this stage of manufacture (Figs 6b–f), with three snapped through the perforation, suggesting this was a high-risk stage. A depression around the drill hole indicates either a tool with a tapered end was used, or the hole involved a two-stage process with the bulk of the thickness removed by a wider-diameter tool and a narrow tool making the breakthrough. Examples of suitable tools, manufactured from red volcanic tuff, are present in the collection (Figs 8a, b). Grinding was then employed to smooth remaining surfaces. Some examples display evidence of a former use. Remnant polish indicates reject and broken tools were being re-worked into fishhooks. The hooks in Auckland Museum are small, with unfinished hooks ranging from 41 to 65 mm in length, with an especially large example measuring 105 mm (Fig. 6b) that shows drilling through the centre from one side and an incomplete perforation from the opposite side to make the central perforation larger.

Excavations elsewhere in Polynesia are characterised by large numbers of fishhooks, reflecting the emphasis on fishing. The few from Pitcairn is a noted contrast. Alternative materials to stone are limited in number. Pearl shell, commonly used throughout Eastern Polynesia, does not grow in the vicinity of Pitcairn and had to be imported. Bone from sea birds, humans, or pig could have been used but no hooks of these materials have been found during the limited archaeological investigations on the island. Historically wood was used elsewhere in Polynesia in conjunction with shell or bone points (Anell 1955), but again there is no evidence of wooden hook use on Pitcairn.

Pearl shell is generally under-represented in Pitcairn's archaeological record: a single pearl shell fishhook, resembling the Mangarevan form (Gathercole 1964: 76), a reported scraper, two worked pieces (Heyerdahl and Skjölsvold 1965b: 156) and a complete shell placed with a burial on one of the *marae* (reported in Heyerdahl and Skjölsvold 1965a: 4). In contrast, multiple pearl shell items including fishhooks have been recovered from investigations on neighbouring Henderson (Molle and Hermann 2018: 81; Weisler 1994: 91, 1996), which also naturally lacks pearl shell, suggesting that the absence on Pitcairn is due to poor survival. The nearest source of shell is Mangareva, and the Henderson hooks display similarities to Mangarevan types, providing evidence for the transfer of shell resources between Mangareva and the Pitcairn Group.

Elsewhere, in the absence of fishhooks it has been suggested that nets may have been the primary method of catching fish (Bollt 2008) but the rocky coastline of Pitcairn is not conducive to this technology. Given the absence of a reef around the island, Weisler and Walter (2016: 377) suggested land-based fishing would have limited returns and canoe-based fishing was more likely, although dependent on favourable sea conditions. On neighbouring Henderson more than 5000 fish bones and numerous fishhooks have been recovered from excavations suggesting fishing played a key role in the economy (Weisler 1994: 95). In stark contrast only a small amount of fishbone is reported from Pitcairn investigations (Gathercole 1964). The limited fish bone evidence, coupled with the under-representation of fishhooks and sinkers, suggests fishing may have been a minor activity. However, the lateritic soils are not conducive to good bone and shell preservation, affecting the representation of both faunal material and possibly fish hooks made of material other than stone.

### Hammer stones / Spherical stones

Two types of tools with percussive bruising, and resembling hammer stones, are represented. The most common are round stones of a grey-brown vesicular basalt with white flecks and a pitted cortex, similar in appearance to natural lava bombs (N=153). These range in size from 28–130 mm and weigh between 26–1549 g. Light bruising, chipping and flattening of one or two faces is present on 90% of those catalogued but may in some cases be natural shape or wear. The remainder show no signs of use and have been compared to sling stones (Hamilton *et al.* 2013; Heyerdahl and Skjölsvold 1965b: 186), although this is speculative as slingstones tend to be elongated and taper to a broad point at one end (York and York 2011).

Repurposed broken tools, most likely adzes (N=17) have also been used as hammers. These are often trapezoidal–sub-triangular in cross section with minor flaking, measure 61–181 mm in length and weigh between 88 and 978 g. Re-use as a percussion tool is evident from the bruising and flattening on the poll or fractured face. The number of hammer stones is not unexpected considering the large amount of stone working evident. In addition to the smaller percussive tools in the collection, large hammers or anvils at Down Ha Cask have use-wear marking consistent with being used as hammers to remove large flakes from boulders (Gathercole 1964: 40).

### Abraders and files

Abraders and files number 158 pieces and were reported from stone working areas (Gathercole 1964: 54). The majority (N=138) are manufactured from red volcanic tuff with hard black crystal-like inclusions and gritty texture, sourced to either Jinser Walley or Down Rope. These are largely fragments with one or more flat faces, ranging in length from 21–323 mm with 88% measuring less than 100 mm. A large worn slab of tuff with a flare to one end and shallow quadrangular cross section (Fig. 7a) is 323 mm in length and weighs 1096 g. Its flat surfaces were probably used for grinding and honing. Large fully ground, planoconvex abraders (Figs 7b, c), with one flat and three convex faces, taper towards each end, with Fig. 7c tapering to a point at one end and a chisel-like edge at the other.

Files are mostly oval in cross section, tapering to one end (not unlike the sandstone files used in fishhook manufacture in New Zealand, or coral files). Figures 8a and 8b are unusual and have a broad point tip and shoulders, suggesting they were used for a specialised purpose such as filing holes to a particular diameter. Very few objects, apart from the fishhook tabs, display evidence of this technique, however, the files were likely also employed in woodworking to enlarge or smooth lashing holes. Five well ground files are manufactured from the same porous vesicular basalt as the *yolla* stones and range from 50–122 mm length. These are all broken transversely and are cylindrical to lenticular in cross section, or multi-faceted and taper to the end (Figs. 8d–f). Figure 8d is perforated through at one end and may have served another function. The remainder (N=14) are small fragments of volcanic stone, measuring 44–150 mm in length and largely triangular to quadrangular in cross section with minor grinding to one or more face. The single coral abrader (Fig. 8c) measures 95 mm, is sub-rectangular in outline and worn on all surfaces. Corals are present in the water surrounding Pitcairn at a depth of 10–30 m and fragments would have been accessible (Irving and Dawson 2013).

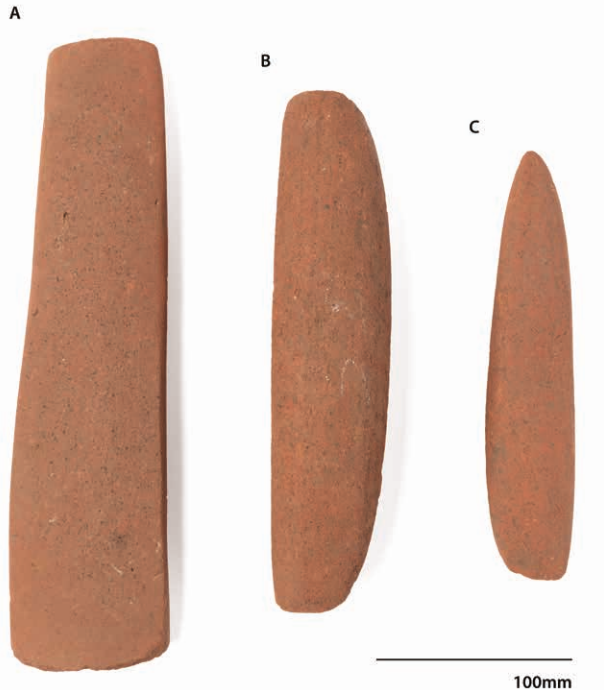


Figure 7. Abraders, red tuff. Auckland War Memorial Museum 28389, 28331.2, 28331.1


Figure 8. Files. A–B, red tuff. C, coral file. D–F, vesicular basalt. Auckland War Memorial Museum 28894.3, 28894.5, 29090, 28358, 28596, 30658

## Stone points

Stone points are the second most common tool type in the collection (Figs. 9, 10), numbering approximately 1355 catalogued objects. They have been termed stone points in that they have been reduced by flaking to a narrow, pointed end but they may have had several different uses. Manufactured from fine-grained basalt, likely from the Tautama source, the points are similar in appearance to those previously described (Gathercole 1964: 66; Heyerdahl and Skjölsvold 1965b: 155). Although Auckland Museum registers from the 1940s commonly refer to these tools as either rimers or awls, the terminology does not appear to relate to the physical variation observed and all have been reclassified as stone points.

Complete points measure 42 to 242 mm in length. The most common cross sections are triangular (42%) and trapezoid (35%) but quadrangular, planoconvex and lenticular sections also feature. At least two main types of points have been recognised due to manufacturing differences. The larger examples are typically refashioned from existing tools such as chisels, adzes or roughouts that have broken during manufacture or use. The fractured end has been re-flaked and shaped to a long, tapered point (Figs 9a, b), and in some examples sloping shoulders created where the grip transitions to the point. Where the former adze has broken transversely, and the blade selected for refashioning into a point, the flared blade has been re-purposed as a haft. Additional

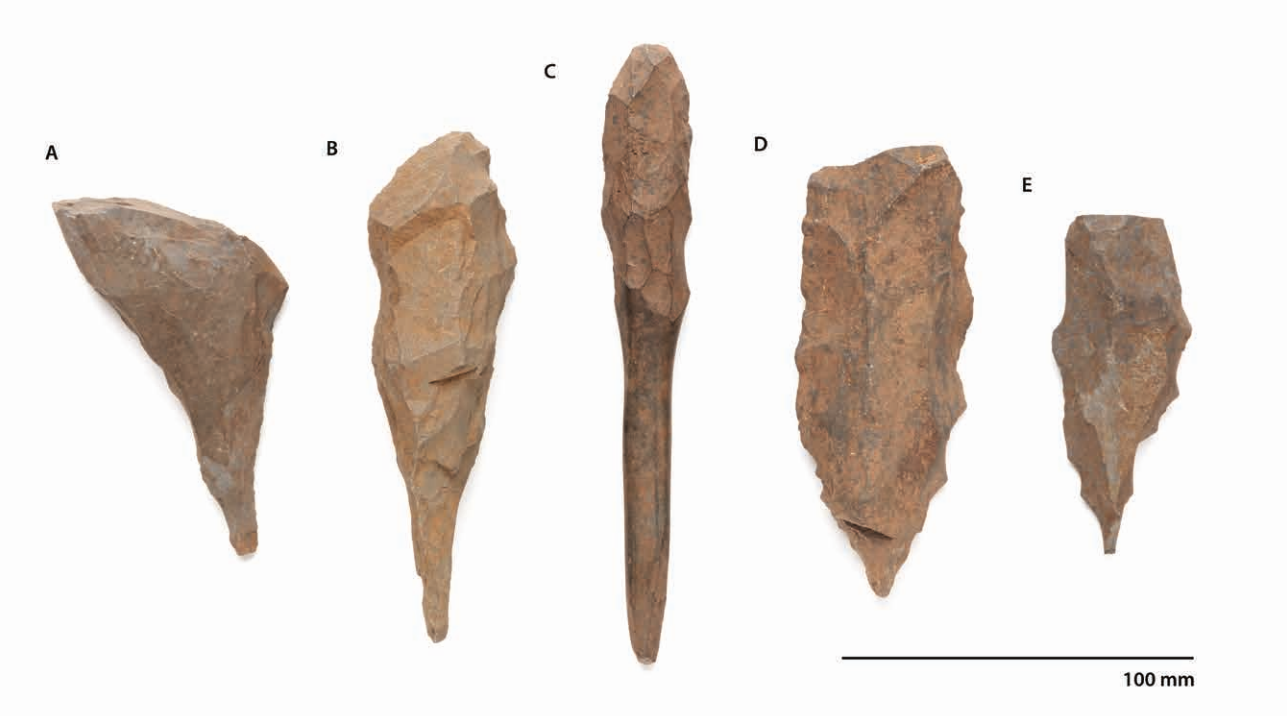


Figure 9. Basalt tools re-worked into stone points. Auckland War Memorial Museum 30555.6, 28505.5, 28816.2, 27628.4, 28384

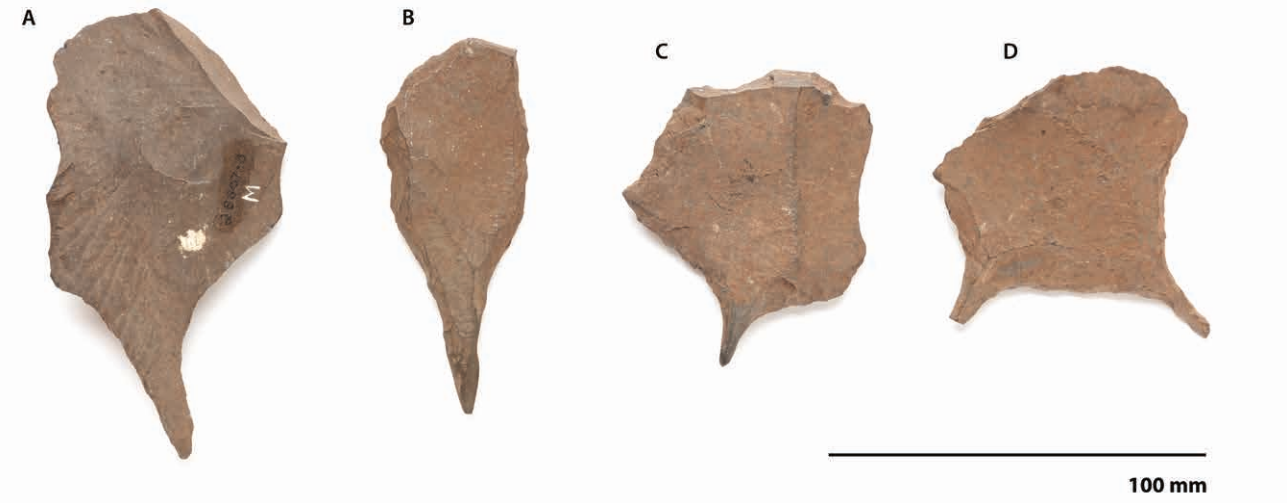


Figure 10. Stone points manufactured from flakes. Auckland War Memorial Museum 28807.3, 33146, 1985.332.40, 32673.

examples of this type have an oval, bulbous grip which is flat on one face and convex on the other, with polish or hammer-dressing in the haft area on a small number of examples. Figure 9c is especially well made, measuring 147 mm in length with a bulbous flaked haft that is flat to one face, transitioning into a long, well ground point similar in appearance to a modern screwdriver.

Smaller, finer points were manufactured from flakes, shaped by secondary flaking to produce a long or short, tapered point. Shoulders are often prominent on these points and a number retain the striking platform and bulb of percussion (Fig. 10). Approximately 7% have two or more points on one tool (Fig. 10d). A common feature on all fine points is the polish and use-wear all around the tip extending up the shaft of the point, indicating use as drills or awls. The tip of the point has snapped off 28% of the points catalogued and 9% show signs of fire and chipping damage. Residue was not observed on any of the catalogued points.

The high incidence of stone points, and variation in point thickness and length, supports inferences about the importance of wood-working on the island (Turner 2010). Points were employed in the drilling and reaming of holes for lashings in composite canoes and house timbers among other wood working activities. However, it is unlikely the finer points or awls were employed in canoe manufacture and their use remains unknown. Interestingly, stone points of these types appear to be unique to Pitcairn and have not been reported in large numbers from neighbouring islands, with only a few, manufactured on stone flakes found on Henderson (Weisler 1995: 392).

## Pounders

There are eight complete and three broken stone pounders in the collection and could have been used for mashing foods such as breadfruit to create pastes, and to crush leaves, bark and roots for dyes. The pounders are manufactured from both coarse and fine-grained basalt. The simplest forms (N=3) are water-rolled cobbles of an elongated oval shape with bruising to the ends on the long axis. They measure between 127 mm and 158 mm in length. Additionally, there are elongated water-rolled cobbles that show no evidence of modification or use despite suitability. A second form (N=5) are oval in cross section and are shaped through hammer-dressing to reduce the butt and create a knobbed handle for grip (Fig. 11). These examples flare to a flat pounding surface and are larger in size with complete examples ranging from 111–228 mm in length, and 861–2034 g.

Three more elaborate pounders are similar in style to the T-bar Tahitian food pounder (Hooper 2006) with a cross-bar handle and oval cross section flaring towards a circular flat pounding face (Fig. 12). This form is between 143–180 mm in length and weight ranges from 1464–3084 g. Two are manufactured from fine-grained basalt, are well shaped and ground. The third example is made from vesicular basalt and is much simpler in appearance. The Tahitian style pounders are likely associated with the later Bounty-related occupation of the island.


Figure 11. Stone pounder. Auckland War Memorial Museum 12552


Figure 12. Stone pounder of Tahitian form. Auckland War Memorial Museum 26528

### Sinker

A single sinker (Fig. 13) is manufactured from coarse basalt. Measuring 159 mm in length and weighing 2,690 g, it is spherical with a suspension hole drilled at the top. However, unmodified stones may have been tied on as a weight, and there is no shortage of beach cobbles or other stones such as the inferred lava bombs.

### Miscellaneous objects

Many of the stone tools equate with those found elsewhere in East Polynesia, including New Zealand. However, some forms appear unique to Pitcairn, including unique, multi-point tools manufactured from fine-grained basalt. Examples of special mention include a six-pointed star-shaped tool (Fig. 14a) measuring 136 x 112 x 15 mm. The projections are different lengths with rounded, blunt tips. The concave spaces between the projections have been flaked to create curves of varying width.


Figure 13. Sinker. Auckland War Memorial Museum 28357

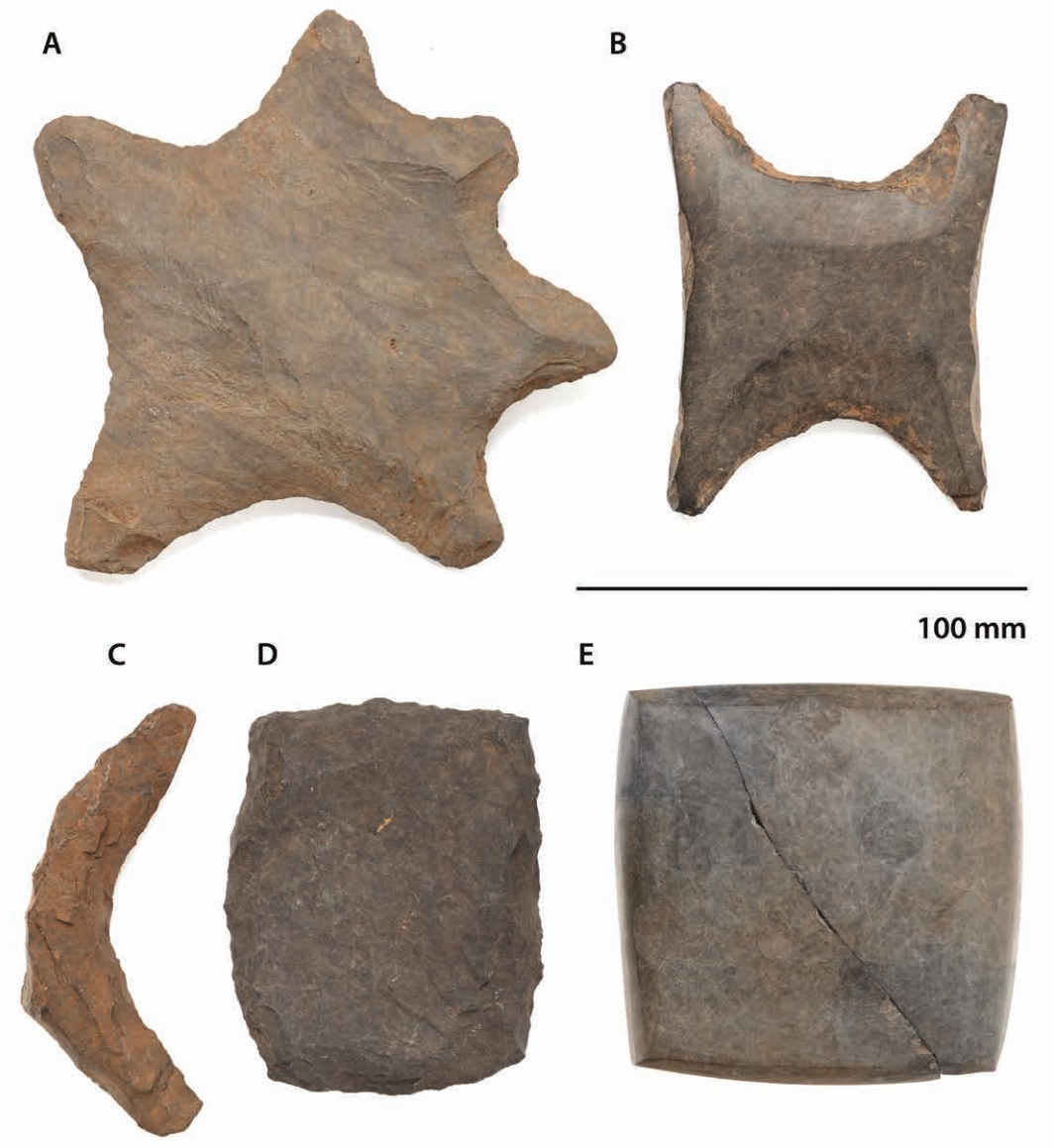


Figure 14. Unique tools. A–B, wood scrapers. C, curved tool of unknown use. D, possible palette or fishhook roughout. E, stone palette. Auckland War Memorial Museum 36087, 18810, 2020.x.29, 24628.3, 2020.x.27

Another example (Fig. 14b), also manufactured from fine-grained basalt, is square in outline and has been flaked laterally to create curved edges and blunted points that do not appear to have been used for drilling but are a by-product of the reduction of the sides. It has a shallow quadrangular cross section, measures 96 x 70 x 30 mm and is fully ground on the remaining edges and broad faces. Likened to a fishing line holder by Gilbert Archey (Furey and Ash 2020: 8), this object, along with the other multi-point tools, are more likely to be scrapers or spokeshaves for shaping round wooden shafts of different diameters. Figure 14b, with the concave edges shaped through bifacial flaking, is the only example that displays polish on the broad surface, suggesting reworking from one of another tool form.

Tools of unknown use include narrow crescent-shaped objects with a triangular cross section. Three examples measure around 100 mm in length, are shaped through flaking and taper at both ends: flaking is most extensive on Figure 14c that in shape resembles a barracouta hook point from New Zealand, where the distal end of the point slots into a wooden shank.

Also present are palette-like objects. These are square in outline with right-angled or curved corners, well ground, and with one flat and one concave broad face. A complete example (Fig. 14e) measures 91 x 90 x 16 mm and is ground all over. Figure 14b would have been similar before reduction of the sides to create a scraper. In addition to these well-made examples there are similar rectangular objects with polish and flaking around the edges, described earlier as fishhook blanks, but could also be an early stage of manufacture for the palette-like objects (Fig. 14d). Collectively these demonstrate the uses to which high-quality basalt could be flaked and worked into unusually shaped tools.

## Stone flakes / Scrapers

Despite the prevalence of stone working on Pitcairn and the mounds of debitage reported (Cowell 1965), stone flakes (Fig. 15) are under-represented in the museum collection and are largely restricted to flakes that display secondary flaking and use-wear. This absence is attributed to collecting behaviour that monetarily rewarded collectors for shaped objects over unmodified stone flakes (Furey and Ash 2020).

Flakes of fine-grained basalt (N=113) range from 22 to 193 mm in length. Gathercole (1964: 42) reported large flakes were obtained from beach boulders but size of these compared to those in the museum collection is unknown. Retouched flakes (Figs 15b, c) have secondary flaking to the distal end where small flakes have been detached to form a sharp edge for cutting or scraping. Approximately 20% of the catalogued basalt flakes have use-polish along one edge indicating use on a hard abrasive material, or remnant polish from the previous tool form (Figs 15a–c). Broken adze blades were also likely employed as scrapers as chipping damage is present along the used edges.

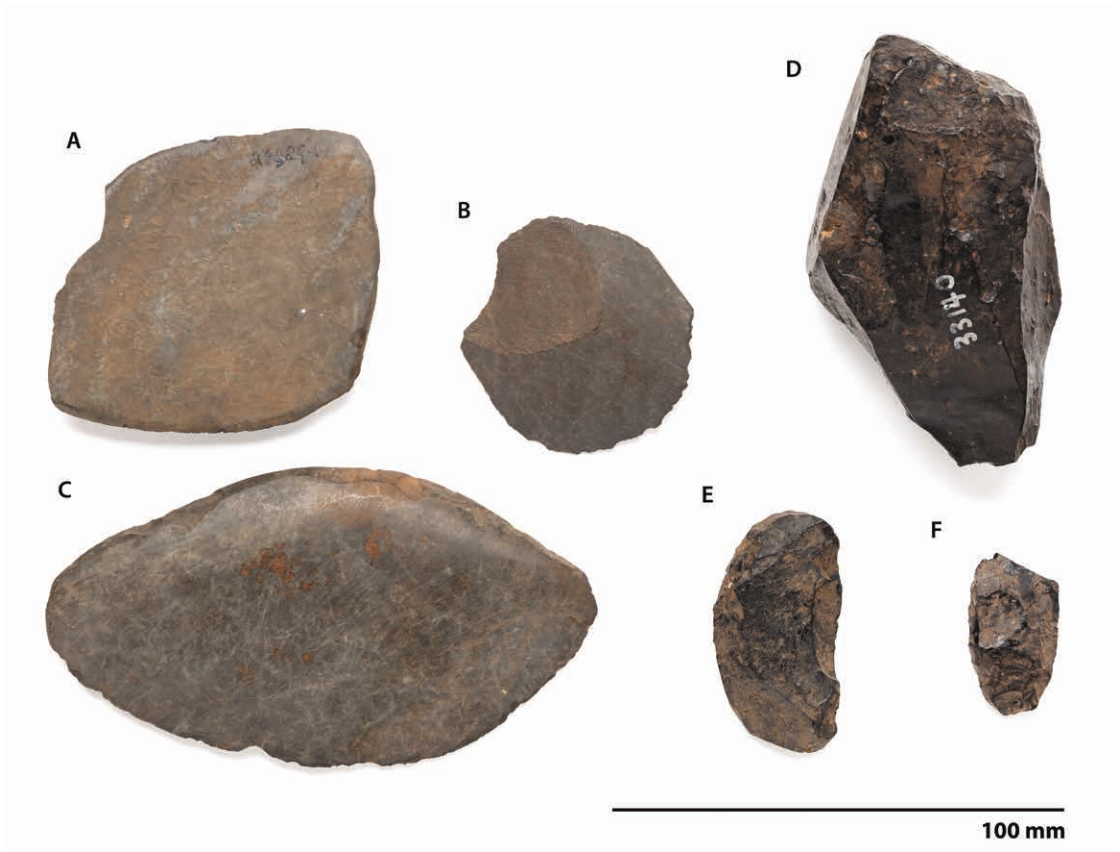


Figure 15. Scrapers and stone flakes. A–C, scrapers. D–F, flakes and cores of volcanic glass. Auckland War Memorial Museum 28329.1, 1985.332.127, 1985.332.19, 33140, 28903.2, 28589

There are seven cores and flakes of dense grey volcanic glass of poor quality, likely the local source (Figs 15d–f). Cores display only one or two small flake scars and their size fits Gathercole's description as small inclusions in ignimbrite. There is no evidence on the island of a large flow source.

### Yolla Stones / Food Graters

Within the collection are distinctive stone items interpreted as food graters, believed to be from the post-Bounty period as similar objects were taken to Norfolk Island during the forced resettlement of all Pitcairn Islanders in 1856 (Erskine 2004: 242). On Norfolk they are known as *yolla* stones and placed on a four-legged wooden stool with a projecting neck similar to stools used for coconut grating (http: norfolkonlinenews.com/non-heritej-nyus-heritage-news/).

Two near complete slabs and five fragments are made from vesicular basalt that is coarse and porous (Figs 16a, b). Transverse and longitudinal grooves on both broad surfaces form a grid of raised knobs or 'teeth', which, together with the open texture of the basalt, would shred vegetable flesh. The finished edges of the objects are straight and ground smooth. The largest and most complete example measures 140 x 134 mm (Fig. 16a). Broken examples predominately display transverse or oblique breaks through the centre of the slab, likely the weakest point. Two examples have at least one narrow cut mark (groove) on the broad face outside of the grid patterning. The slabs are between 22–30 mm thick, with one outlier being 92 mm thick. In addition, six slabs of the same vesicular basalt show shaped edges and evidence of grinding to all surfaces, but do not have the raised 'teeth' seen on the other examples. Figure 16b has a different surface treatment and is pitted, most likely using a stone point to further roughen the faces.

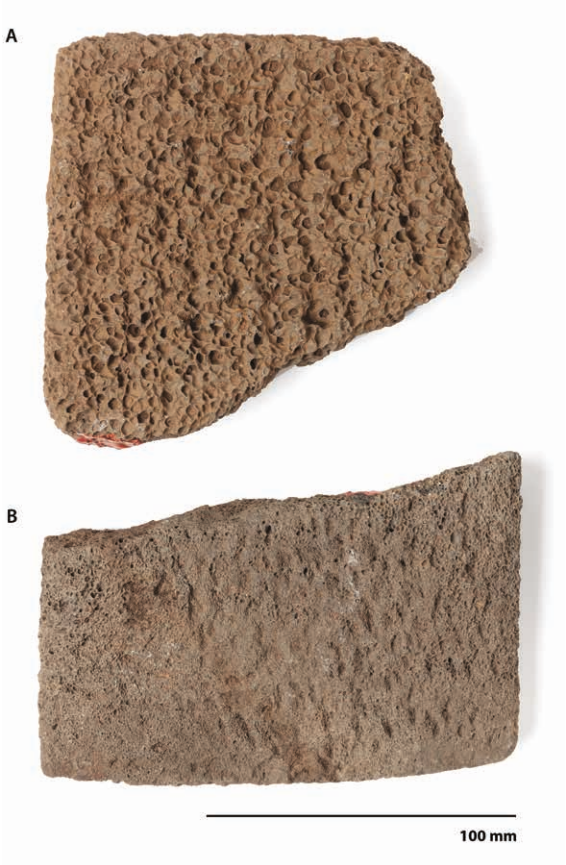


Figure 16. Yolla stones or food-graters. Auckland War Memorial Museum 28593, 28592

Preparation for a variety of food dishes throughout Polynesia involved peeling, grating, pounding, kneading, chopping and scraping, although tools varied across island groups (Leach 2008). The *yolla* stones, because of their shape and width, were not used to grate the flesh from the coconut shell but could have been used to process taro and breadfruit which grew on the island (Erskine 2004: 37). More commonly cowrie shells, absent from Pitcairn, were used to scrape the skin from the breadfruit (Allen and Ussher 2013).

## PITCAIRN'S STONE INDUSTRY & INTER-ISLAND INTERACTION

Stone provenance studies have shown contact between island groups was maintained for several centuries after initial settlement (Weisler 1997). An interaction sphere existed between Pitcairn, Henderson and Mangareva (Weisler 1994, 1996, 1997) where Pitcairn provided fine-grained basalt and volcanic glass to Henderson and Mangareva. In return black-lipped pearl shell (*Pinctada margaritifera)* and economic plants such as swamp taro *(Cyrotosperma sp.)* and candlenut (*Aleurites moluccanus*) were likely imported to Pitcairn and Henderson from resource rich Mangareva (Green and Weisler 2002: 233; Molle and Hermann 2018: 80). Henderson, a raised limestone island, also received vesicular basalt for oven stones (Weisler 1996, 2002: 254). Connections between island groups through the exchange of resources and people likely aided the survival of small populations on remote and marginal islands.

Pitcairn has been attributed the role of a quarry island (Sinoto 1983: 61) or place of specialist adze manufacture, where large and elaborate adzes were produced and traded as prestigious goods (Molle and Hermann 2018: 77). However, these interpretations of the island's stone industry are based on small and selective collections (Brown 1900; Emory 1928; Figueroa and Sanchez 1965). Good quality basalt allowed unique objects to be produced (Gathercole 1964; Weisler 1996: 621) but the conclusion by Molle and Hermann (2018: 77) that types 3 and 4 adzes were of exceptional size (over 300 mm in length) is not supported by the evidence: the few complete examples measure between 148 and 249 mm in length (Figueroa and Sanchez 1965; Turner 2010: 141). Beyond the southeast network, only a single Pitcairn-sourced adze is known from Katiu Atoll in the Tuamotu Archipelago (Collerson and Weisler 2007), and volcanic glass from Atiahara on Tubuai in the Austral Group (Hermann *et al*. 2015). Despite the large quantity of worked basalt in the Atiahara site, none has been identified as from Pitcairn (Hermann 2013). Further, the adzes sourced to Pitcairn on Henderson, Mangareva and the single Pitcairn adze from the Tuamotu Group are not large prestigious objects (Richards 2019: 180). Tautama

basalt roughouts, flakes, cores and associated debitage demonstrates raw material, not just finished adzes, was being transported to nearby neighbours (Weisler 1994: 94, 1996: 624, 1997: 163; Green and Weisler 2002: 233).

There is a striking contrast between the limited distribution of Tautama basalt from Pitcairn and basalt from the Marquesas Island of Eiao, which has been identified in the Society Islands (Weisler 1998), Mangareva (Weisler 1998), Tuamotus (Collerson and Weisler 2007), Austral Islands (Hermann 2013) and Line Islands (Di Piazza and Pearthree 2002), and basalt from the Society Islands which is present on Mangareva (Weisler and Green 2001). Richards (2019: 8) attributed three basalt adzes from Pitcairn in museum collections to a Marquesan source, although the analytical data needs to be examined further. It is possible that some of the adzes analysed by Richards (2019) may have been incorrectly assigned to Pitcairn: for example, two quartz projectile points in Pitt Rivers Museum collected on Pitcairn in 1883 (Hamilton *et al*. 2013; Heyerdahl and Skjölsvold 1965b: plate 1) have no parallels in form or material on the islands of East Polynesia, and while they were collected on Pitcairn it is unlikely they were made on the island. Several interaction spheres have been proposed for Eastern Polynesia (Rolett 2002; Weisler 1996; Weisler and Walter 2016), where materials were transported, sometimes to distant islands based on networks of economic exchange, yet the very small quantities of imported Pitcairn stone does not fit models of major trading and resource sharing. The limited distribution of Pitcairn basalt and the apparent presence of Marquesan basalt on Pitcairn could provide an example where social systems based on maintaining ancestral connection and relationships played a greater part than economic exchange. Further investigation is needed to shed light on the settlement of Pitcairn and its role as a source of good quality stone.

The contraction of inter-island voyaging throughout East Polynesia around AD 1450 (Rolett 2002; Weisler 1996) has been cited as the catalyst for the abandonment of the islands within the Pitcairn Group (Weisler *et al*. 2016: 8154). However, the population of Henderson was able to survive for almost another 200 years after the loss of inter-island voyaging, with radiocarbon dates placing abandonment around the early 17th century (Weisler 1994: 89–90, 1995). Therefore, the abandonment of the Pitcairn group prior to European arrival is undoubtedly multi-faceted and a complex interplay of socio-political and ecological factors (Anderson 2001) and their impact on the island's carrying capacity (Weisler *et al*. 2016; Molle and Hermann 2018: 89). A documented equivalent is the transfer of Pitcairn Islanders to Tahiti in 1831 due to drought and weather events, and the later 1856 removal of all islanders to Norfolk due to environmental damage resulting from high population (Erskine 2004; Furey and Ash 2020: 5).

The museum collection of Pitcairn stone tools, although not *in situ*, provides the opportunity for investigation of stone tool technology in Eastern Polynesia in the first few hundred years of colonisation. Different methodologies in adze reduction are apparent, varying with intended cross section shape (Clarkson *et al*. 2014, 2015; Kahn 2009; Hermann 2013; Jennings *et al*. 2018; Jennings and Weisler 2020; Shipton *et al*. 2016; Turner 2000). While Duff (1959) focussed on differences in adze shape reflecting cultural connection, recent studies indicate properties of the stone heavily influence shape and manufacture (Jennings and Weisler 2020; Sheppard *et al*. 2001; Turner 2000; Turner 2010: 147–148), highlighting the need for further investigation. The Pitcairn assemblage can be assessed against these studies to further understand the range of Polynesian stone-working strategies. Comparison with continental rocks in New Zealand with similar physical characteristics also needs to be explored further and whether similar reduction techniques were employed. Duff (1959) certainly drew links between Pitcairn and New Zealand, based on the similarity of stone tool technology, that have no evidential basis. The stone points and the more unusual tools, some with elaborate hafts, have no equals anywhere. Further investigation is warranted into the activities they were used for, and whether they are a unique response to tool requirement for activities which elsewhere were carried out using other materials.

## CONCLUSION

The large Pitcairn collection housed in Auckland Museum comprises a range of tool types across all stages of manufacture, use and repair. Adzes, chisels and gouges make up the bulk of the collection, with a number displaying unique attributes such as a flared blade on type 2 and 3 adzes, and butt modifications such as projections on type 6 gouges. The second most common tool are stone points, which are made on stone flakes or recycled from broken tools. The number and variation presented within this tool type is indicative of a broad range of wood working tasks such as forming holes and grooves for lashing, and possibly carving.

This focus on Pitcairn artefacts has shown how little is known of the history of settlement of the island: when it was settled and when it was abandoned. The adze forms and unique tools raise many questions about activity on the island. The basalt is fine-grained and of good quality, yet, unlike basalt from other islands, hasn't been widely distributed in Eastern Polynesia. Research is needed into how well the stone performs in a variety of tasks to eliminate the properties of the stone as a reason for its apparent limited off-island use. Not only were finished adzes not widely distributed but unfinished adzes and unmodified stone were also not regularly dispersed. The wider island absence of what is currently perceived as valuable Pitcairn stone may be due to Pitcairn's isolation or suggest social systems were more important than economics, and that the key component of interactions among neighbouring islands was maintaining *whakapapa* [genealogy] links and establishing new connections with gifted goods to cement relationships.

The collection is complementary to the material excavated from several sites by Gathercole in 1964, housed in Otago Museum. Although little is known of the excavated material, or the excavations, it is assumed to largely consist of stone flakes and other tools from documented contexts, and geological samples. Unfortunately, due to past collecting practices that did not

consider the importance of context, the Auckland Museum collection is largely unprovenanced within the island although there are exceptions. Despite these shortcomings the size of the collection and representation of tool types makes it valuable for research on the complex interplay between raw material and morphology, technological adaptation, breakage patterns and geochemical studies, and the role of inter-island voyaging in sustaining small populations on ecologically improvised islands.

## ACKNOWLEDGEMENTS

Thank you to Emeritus Professor Peter Sheppard and Professor Marshall Weisler for their valuable comments and suggestions which improved the paper. Auckland Museum photographer Jennifer Carol imaged the objects.

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*Manuscript submitted 12 July 2022: accepted 11 November 2022.*